Vol. 109 No. 4 August 21, 1948

The American FERTILIZER

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But what of the following year ... and the next ... and all the years to come?

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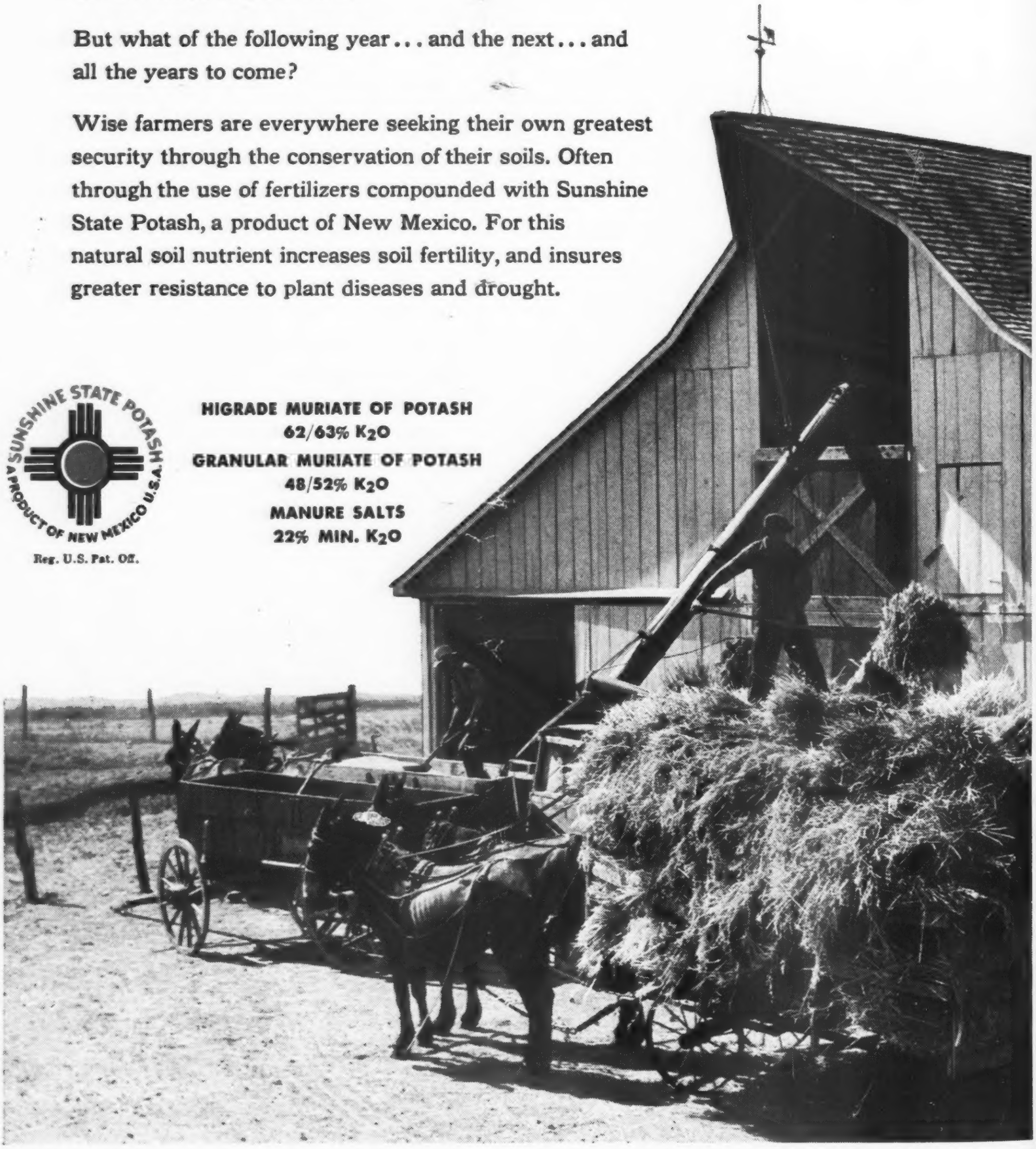

UNITED STATES POTASH COMPANY, *Incorporated* • **30 Rockefeller Plaza, New York 20, N.Y.**

Published every other Saturday. Annual subscription: in the United States. \$3.00; Canada and Mexico, \$4.00 other countries, \$5.00. Entered as second-class matter. January 15. 1910, at the Post Office at Philadelphia. Pa., under Act of March 3, 1879. Registered in United States Patent Office. Publication office. 1900 Chestnut St., Phila. 3. Pa.

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The American FERTILIZER

Vol. 109 AUGUST 21, 1948 No. 4

Suggested Permanent Soil and Water — Use Program and the Probable Role of Fertilizers in it*

By DR. J. T. SANDERS, *Legislative Counsel, The National Grange*

THE subject assigned to me is most stimulating, because I believe our nation and the world are at a decided turning point, at the dawn of a new era in the use of conservation of soil and water resources, and in the role that fertilizers will play in a permanent conservation program.

Let me give you a brief summary or preview of my thesis: The 19th century saw a remarkable increase in both the numbers and net welfare of the peoples of the world, which was made possible in the main by expanded food production on the prairie earth solids, that up to now, as you know, have needed and used little fertilizer, and by the advent and full bloom of the industrial revolution. We have come to the place where very little expansion of virgin food production area, especially on the prairie soils, remains in the world, yet population's growth is still at such a rate that, if unchecked and in the absence of expanded food output, we shall face greatly increased food-population pressure. We are even now in the new era of meeting this added pressure; and soil and water conservation plus greatly increased sound use of commercial plant food is to play major roles in meeting the long-time food pressure problem of our nation and world. This important and expanding role of fertilizer calls for broad gauged long-time vision and planning on the part of the industry. The Grange insists that if the industry falls short of this vision and the necessary expansion, Government assistance must, of necessity, be brought into play.

A little over a hundred and forty years ago a shrewd Englishman, Robert Malthus, published a book on the laws of growth of population and the natural and man-made checks on this growth. Malthus and other thinkers of his time were profoundly worried when he came to the conclusion that mankind tended to reproduce at a far more rapid ratio rate than its increase of ability to sustain itself in health and happiness. As a result, economics became known as the dismal science. Malthus came fairly close to basic tendencies in human nature in his conclusions when he said that this basic tendency for man to overpopulate the earth would proceed at a rapid rate until starvation faced him; that this rate of growth could be checked only by two classes of checks—both of which were then considered highly undesirable. They were preventative and positive checks. Preventative checks were control of birth rate, postponement of marriage, continence, prostitution, etc. Positive checks were starvation, disease, war, pestilence, pauperism, etc., To Malthus' credit, he upheld only those checks which seemed to him moral in nature.

* Presented at the 23rd Annual Convention, The National Fertilizer Association, White Sulphur Springs, W. Va., June 21–23, 1948.

The remarkable thing about this Malthusian doctrine was that in the light of the then known and considered facts, Malthus was not seriously at fault in his analysis or logic. Where he was seriously in error was in overlooking the new forces that countered his conclusions.

He wrote at the very dawn of the 19th century, at the beginning of the industrial revolution, which not only brought with it multiplied productive capacity per man but also hundreds of thousands of new and undreamed of comforts. As a result, the growth of peoples of the earth which, according to Malthus, was rapidly approaching starvation levels, has, contrary to his conclusions, much more than doubled, yet has actually increased its potential standards of living by possibly three to four times that of the earth's people in Malthus' day. This is a remarkable record —namely, an increase of peoples in a short span of slightly over a hundred years that equals the net growth of man in all the uncounted years of the earth's history before the time of Malthus—yet possible quadrupling the available means of comfort and sustenance of this doubled population.

Increase in Population

For the 50 years prior to Malthus, the population of the world increased 24 per cent. For the first 50 years after his time (1800–1850) the increase was 29 per cent; for the next half century it was 38 per cent; and for the recent 50 years 46 per cent. Until now the percentage of growth will, therefore, be seen to be at a rapidly increasing rate of growth. Since the war began, and despite the war, the net increase in the world's population has been equal to the present population of the United States. Although population experts assure us that we are approaching or have reached the maximum rate of growth, actual growth figures to date do not appear that way. That's what Malthus thought and said for his day also and, as we now know, he was very much in error. In absolute figures and possibly in percentage increase, the world's population growth during the current decade has been the greatest in history. Barring some unforeseen calamity, world-wide in scope, such great phenomena as population increase do not change suddenly form their set course. Barring such a world-wide calamity, ten to 15 years from now the world will probably have an additional population to feed that about equals the present population of the Soviet nation. Does this not pose a very interesting question to you of the fertilizer industry?

How was it possible to more than double the world's population and to quadruple the standards of living during the century and a half following Malthus? The principal source of the increased food and raiment came from greatly expanded use of prairie soils, of use of power and machinery in food production, improved transportation and conservation of food. As fertilizer manufacturers, it is important for you to note that fertilizers played a relatively small part in this world food expansion and population growth. Only in the latter quarter of the century did fertilizer come into considerable use. Even now there is only slightly over 14 pounds of fertilizer available per year for each acre of crop land in the world. This tremendous advance in food production from the beginning to the end of the 19th century was almost entirely traceable to the expansion of production onto the hitherto almost unused prairie soils of the world. These are still the soils that make relatively little use of commercial fertilizers.

Expanded Food Production

Prior to Malthus, people could live in large numbers only in forest areas where water, fuel and shelter could be had readily at hand without transportation. Only with the advent of modern transportation, modern well-drilling machines to obtain water, and numerous other things that came with the industrial revolution, was it possible for man to expand out onto these prairie earth soils. Nearly all the expanded food production of the 19th century took place on these drier prairie soils.

The prairie earth soils, especially the black earth soils and to a less extent, the brown earth soils, were, in their virgin state, the richest soils of the earth and were lying out untouched ready for immediate use by man for full food production. We in the United States were blessed with the largest, and the most accessible body of these great soils in the world and as a consequence our corn and grain belt is truly the real bread basket of the world. These soils were abundantly filled with lime and the other mineral requirements —the result of ages of practically unleached soil building processes of the grassland.

Many of these soils so richly endowed with necessary minerals, even where moisture supply permitted, could not, under past prices of fertilizer and grain, economically utilize fertilizer. Even now these rich endowments of the minerals of nature are becoming so dangerously exhausted that from now on at an ever accelerated pace these lands will profitably absorb fertilizer. Many of them, however,

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FERTILIZER PAPERS AT AMERICAN CHEMICAL SOCIETY MEETING

Abstract of Papers from Meeting of the Division of Fertilizer Chemistry, Hotel Annapolis, Washington, D. C., September 1, 1948

Stability of 2, 4-D in Mixed Fertilizers

Paul C. Marth, John O. Hardesty, and John W. Mitchell, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

Experiments conducted on the selective herbicidal effects of 2, 4-dichlorophenocyacetic acid (2, 4-D) when mixed and applied with complete, 10–6–4 fertilizer indicate that the mixtures can be stored for as long as 10 months without loss of potency. At the start of the experiments individual 25-pound batches of fertilizer containing 0.5 per cent 2, 4-D were made up with relatively high moisture content (7.0 per cent), others were of low moisture (4.87 per cent) content. Some batches were stored continuously at 30° C. while others were heated for two weeks at 60° C prior to 30° C storage. At intervals up to 10 months, aliquots from each batch were removed and applied at the rate of 600 pounds of fertilizer and three pounds of 2, 4-D per acre to weedy sod plots of 50 square foot area. Freshly prepared mixtures of fertilizer and 2, 4-D were included for comparative purposes, along with fertilizer alone and unfertilized control plots. Data collected on the fresh weight of clippings of both grass and weeds obtained after three and 10 months of storage showed no significant differences among the fertilizer-2, 4-D treatments. The average percentage of weeds in the total weight of clippings was 1.5 or less from plots receiving 2, 4-D, irrespective of moisture content, heating or length of storage of the fertilizer mixture. Comparable unfertilized control plots averaged 22.4 to 47.4 per cent weed clippings by weight. Because of the effect of the fertilizer and the lack of weed competition, the grass in the plots treated with the mixtures containing 2, 4-D showed significant increases in yield.

Flower and Corm Production of Gladiolus As Affected by Fertilizer Applications in the Greenhouse and in the Field

W. D. McClellan, Neil W. Stuart, and K. G. Clark, U. S. Department of Agriculture, Beltsville, Md.

The effect of nutrient solutions and fertilizers on the growth and production of gladiolus has been studied in the field and greenhouses since 1943. Nitrogen was the most important single element in the growth of Picardy corms and cormels grown in quartz sand for two years and fed with various nutrient solutions. Growth from corms was limited the second year by deficiencies of phosphorus and potassium. During the second year no cormels were produced from boron-deficient plants and few from potassium-deficient ones. With cormels, phosphorus and potassium, as well as nitrogen, limited corm growth the first year. Growth of Picardy gladiolus the second year in subirrigated beds at each of two rates of application of nitrogen, of phosphorus, and of potassium, was at the expense of the mineral reserve in the corms during the first month. Later the plants utilized phosphorus very efficiently. Average corm weights at harvest the second year were: $N_1P_1K_1$, 6.1; $N_1P_2K_2$, 7.1; $N_2P_1K_1$, 11.3; $N_2P_1K_2$, 13.2; $N_2P_2K_1$, 13.8; and $N_2P_2K_2$, 15.7 grams. The flowering date was not affected by nutrient treatment; but flower spikes were shortest, and the number of florets least, from corms receiving low nitrogen. Field trials with various organic and inorganic fertilizers supplying 40, 80, or 160 pounds of nitrogen per acre applied before planting, or as side-dressings, showed that any soil of reasonable fertility can be used to produce quality flowers from forcing-size corms, and that gladiolus are more overfertilized than underfertilized.

Studies of the Biological Measurement of the Nutritive Value of Forage Plants as Influenced by Fertilization

Gennard Matrone, North Carolina State College, J. A. Weybrew, U. S. Department of Agriculture, Beltsville, Md., W. J. Peterson, and F. W. Sherwood, U. S. Plant, Soil and Nutrition Laboratory, Ithaca, N. Y. and North Carolina State College, Raleigh, N.C.

Plant composition values as determined chemically do not reflect the availability to the animal of nutrients from differentially fertilized forages. Assessment of the nutritive value of forages, therefore, necessitates adequately designed animal experiments for evaluating the variations arising from complex soil-plant-animal interrelationships. Feeding trials with rabbits and sheep have shown that

animal experiments based on proper field designs can segregate some of the variations arising from each component of the complex system. The experimental design involves replicating the animal feeding trials to correspond to the replication in the field. Since young rabbits and lambs will not make optimum gains on many forages when fed alone, the inclusion in the diet of readily available energy in the form of pure carbohydrate improves weight gains and accentuates real differences in nutritive value. Significant differences in gains were obtained in favor of phosphate-fertilized forages as compared to forages not fertilized with phosphate for both lambs and rabbits only when cerelose (corn sugar) was fed as the concentrate portion of the ration. The data from several experiments with sheep and rabbits will be presented to illustrate the experimental designs and techniques evolved for evaluating the nutritive value of forages in fertilization studies.

The Significance of the Relative Energy Properties of Ions to the Intensity of Oxidation-Reduction Reactions of Some Nutrients

H. P. Cooper, South Carolina Agricultural Experiment Station, Clemson, S. C.

The available information from chemical analyses of plants and plant products may be interpreted to suggest definitely that the nutrient content of plants is closely correlated with the energy properties of nutrients as expressed by the oxidation-reduction potential. The intensity factor of energy seems to be a much more significant factor in determining the nutrient content of some plants than the capacity factor as expressed by the ion concentration in the nutrient medium.

The wide variation in the chemical composition of different crop plants grown in the same soil, or other nutrient media, suggests that certain phylogenetic characteristics of these plants may be significant factors in determining the special combination of nutrients which they utilize in their normal development. Many of the more or less fixed phylogenetic characteristics of plants which determine the combination of nutrients utilized by them may be significantly affected by tolerance mechanisms, Which enable them to grow successfully in the presence of excessive quantities of certain ions.

Since chlorophyll is a product of photosynthesis, it is interesting to note the characteristics of some of the primary light energy-absorbing nutrient compounds, which are capable of absorbing the quality of light energy utilized in the formation of the primordial chlorophyll and certain other organic compounds. The very close correlation between the energy values of the light absorption bands in chlorophyll and the free energy decrease in the formation of nutrient compounds, such as the chlorides of the metallic nutrients, and the energy required for the initial reduction of some nutrient anions, definitely suggests that these energy values may contribute to a more satisfactory interpretation of the specific function of certain plant nutrients.

The increase in the relative strength of the hydrogen and oxygen ions in combination with different metallic nutrients may enable the hydrogen and oxygen to enter into organic combinations at higher energy levels than would be possible with a reversible oxidation-reduction reaction at a discharge potential of 1.2 volts for water.

Some Practical Considerations in the Addition of Micronutrients to Fertilizers

George Serviss, Coop. GLF Soil Bldg. Ithaca, N. Y.

Practically all soil chemists, agronomists, and horticulturists connected with the fertilizer industry today are aware of the increasing seriousness of the secondary and micronutrient problem. As agriculture becomes more intensive and farmers strive for higher yields, more and more consideration will have to be given to nutrients other than the conventional three: nitrogen, phosphoric acid, and potash. These are magnesium, boron, manganese, copper, zinc, etc.

There is disagreement as to how they will be added. One school of thought favors the "shotgun" type of addition—a small amount of several. Such an addition might or might not serve as an insurance factor in borderline cases. The other school of thought favors the addition of the specific ones needed by the various crops on the various soil types. This means the addition of substantial amounts of some and may or may not mean insurance dosage of others.

From a manufacturing point of view a uniform shot gun addition definitely has advantages, but at this point, at least in the northeast, it does not appear that this will serve the best interest of the farmers. To illustrate the wide variation in agricultural experiment station recommendations: canning beets, 50 pounds of borax per acre in one area; cauliflower, 20 pounds in one area, 10 pounds in another; onions, 30 to 50 pounds of copper sulfate an acre a year on one muck

(Continued on page 22)

Some Implications of Soil Fertility*

By HOWARD W. SELBY

President, Walker-Gordon Laboratories of New England, Inc.

(Continued from the issue of August 7, 1948)

Conservation

Animal life in all of its forms, forests and other plant life, water sources and fertile soils are all being destroyed at a faster rate than they are being replaced. This is the warning of the Conservation Foundation, now campaigning to halt this rapid destruction of the vast natural resources of the nation. Fairfield Osborn, president of the New York Zoological Society, also head of the Foundation, has indicated five specific points of the status of the nation's natural resources:

1. Of a total of 460,000,000 acres of cultivable land, not over 15 per cent are organized under the soil-conservation program.
2. Fifty per cent more timber is being cut than grown. In the past 38 years the total "woodpile" has been reduced by 40 per cent.
3. Widespread soil erosion has resulted in the destruction of aquatic life.
4. Underground water resources are dwindling in many areas.
5. The animal life situation is "moderately hopeful" because of the tremendous amount of attention paid to it over the past few decades.

These are the areas for battle on the conservation front. The history of every nation is eventually written in the way in which it cares for the soil. As the agriculture of a region diminishes in effectiveness the civilization that rests upon it languishes and decays. The arid parts of Asia Minor, Mesopotamia, North China and Southern Mexico, as well as parts of the Sahara and Central Asian deserts, were once fertile areas supporting energetic and developed races.

The story of the conquest of the soil is of more than historic importance. A new country, constantly growing and possessing an abundance of frontier land, formerly provided an environment which stimulated the development of certain attitudes of mind and habits of conduct on the part of those who came to take possession of it—traits of character which still persist and with which any program of soil conservation will have to reckon.

Those who developed America came seeking freedom, asking only that they be allowed to work out their own economic salvation and their own happiness as best they would, free from governmental restrictions, subject only to the general rule that this freedom must not infringe on the similar freedom of their fellows.

Such freedom meant freedom to exploit ruthlessly the natural resources of the country and especially the soil. Many of our problems in soil conservation today are the result of poor stewardship.

A statement in a United States Department of Agriculture bulletin reads in part, "Where farmers have both the opportunity and expectation of operating their farms for a period of ten to 20 years, science and experience agree that generally those practices which will save the soil of land that should be in cultivation are also the most profitable for the individual in the long run." Realistically, then, those practices which are morally sound are in the long run profitable to the individual. The well-known admonition, "As a man soweth, so shall he reap" is particularly appropriate.

Society has its roots in the soil. Do the different broad types of soil on which men live result in different types of civilization? What happens when people migrate from one type of soil to another with which they are unfamiliar? Do civilizations fail only when people living on it no longer know how to manage their civilizations?

Ralph W. Gwinn, a New York City attorney, Congressman and Dutchess County dairy farmer, read a paper a number of years ago—his title was thought-provoking. He asked the question, "Is there a relationship between the quality of the people and the quality of the land on which they live?" He suggests that the quality of human society, like that of dairy herds, or any other animal and plant life, depend on the manner in which that society is bred. Where dairy cattle are bred for high milk production, human society seeks those characteristics of capacity for high

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* As presented at the annual June convention, The National Fertilizer Association, White Sulphur Springs, W. Va., June 21-23, 1948.

THE AMERICAN FERTILIZER

ESTABLISHED 1894

PUBLISHED EVERY OTHER SATURDAY BY
WARE BROS. COMPANY
1900 CHESTNUT ST., PHILADELPHIA 3, PA.

A Magazine international in scope and circulation devoted exclusively to the Commercial Fertilizer Industry and its Allied Industries

PIONEER JOURNAL OF THE FERTILIZER INDUSTRY

A. A. WARE, Editor
K. F. WARE, Advertising Manager

ANNUAL SUBSCRIPTION RATES

U. S. and its possessions, also Cuba and Panama	$3.00
Canada and Mexico	4.00
Other Foreign Countries	5.00
Single Copy	.25
Back Numbers	.50

Vol. 109 AUGUST 21, 1948 No. 4

Principal Articles in This Issue

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Superphosphate Production for 1947-48 at Record Level

Production of superphosphate during the fiscal year ended June 30, 1948 reached a new high of 10,825,000 equivalent short tons (basis 18 per cent A.P.A.), according to reports submitted to The National Fertilizer Association and a summary of reports submitted to the Bureau of the Census. That production surpassed the total of the previous year, 9,522,000 tons, by 14 per cent, and it was 28 per cent above the 8,430,000 tons reported for two years ago. The P_2O_5 content of superphosphate produced during the past fiscal year was 1,948,000 tons. Production during the recently completed fiscal year was also five per cent greater than total production during the 1947 calendar year.

Production of normal superphosphate, of course, accounted for the bulk of total superphosphate production. Such production, amounting to 9,710,000 tons (18 per cent APA), increased 13 per cent over the previous fiscal year. As a percentage of total production, normal superphosphate represented not quite 90 per cent this year, which was a little less than last year when it comprised slightly over 90 per cent.

Production of concentrated superphosphate, which amounted to 420,000 tons (45 per cent APA), showed a substantial increase, 17 per cent, over the 359,000 tons reported for the 1946–47 fiscal year. With respect to the 10,825,000 ton total, concentrated superphosphate represented almost ten per cent, a slightly higher percentage than during the 1946–47 fiscal year.

Fiscal year production of wet base goods, totaling 66,400 tons (18 per cent APA), increased 28 per cent over the 51,700 tons reported for fiscal 1946–47.

SUPERPHOSPHATE PRODUCTION
(July 1 to June 30)
Short Tons

	Normal 18% A.P.A.	Concentrated 45% A.P.A.	Base Goods 18% A.P.A.
1947–48	9,709,671	419,582	66,359
1946–47	8,573,034	358,904	51,695
1945–46	7,678,316	281,625	47,912
1944–45	6,773,874	246,632	35,568
June, 1948, Output			
Production	732,500	36,002	3,044
Shipments and used in reporting plants	552,544	45,944	1,792
Stocks on hand, June 30, 1948	1,666,398	49,627	3,335

Four Companies Allotted Army-Produced Anhydrous Ammonia

Four fertilizer plants have received initial allocations of Army-produced anhydrous ammonia, John L. Haynes, acting director, Office of Domestic Commerce, Department of Commerce, announced on August 19th. The allocations, totaling 124 tank cars containing 2,655 tons of nitrogen, are for August and September delivery to the plants which have been completely or partially shut down due to lack of anhydrous ammonia.

The allocations were made in accordance with a provision of the Foreign Aid Appropriation of 10 per cent of the anhydrous ammonia produced by or for the Army, and establishes certain allocation preferences among producers of ammonium sulphate.

In accordance with ODC Distribution Order D-1, the amounts allocated represent "the minimum quantity of anhydrous ammonia needed to continue or return the particular plant to the production and sale of ammonium sulphate." Officials said that availability of anhydrous ammonia from other sources is taken into consideration when making allocations of Army-produced supplies.

The four companies participating in the allocations are: Farm Service Company, Oakland, Calif.; A. F. Pringle & Co., Inc., Charleston, S. C.; Greenville Chemical Co., Greenville, Miss.; and Columbia Metals Co., Seattle, Wash.

New Fertilizer Company in Kansas City

A new company, Farm Belt Fertilizer & Chemical Company, has been organized in Kansas City, Mo., to produce and market superphosphate and mixed fertilizers. This announcement was made on August 14th, by W. Ralph Smith, president of the company. Construction of the plant is already well under way at an estimated cost of $300,000 and it is scheduled to begin operation early this fall.

Mr. Smith has been connected with the fertilizer and chemical industry for more than ten years. He resigned recently as Fertilizer Sales Supervisor for Spencer Chemical Company. Prior to joining Spencer Chemical Company two years ago he was employed by American Cyanamid and Chemical Company.

Other officers of Farm Belt Fertilizer & Chemical Company are: Herman R. Sutherland, Vice-President; Bernard Thompson, Vice-President; W. S. Tyler, Vice-President; Vernon B. Kassebaum, Secretary; Doyle Patterson, Treasurer; Sam C. Pearson, Jr., Assistant Secretary and Treasurer.

Canadian Company to Produce Sulphuric Acid and Superphosphate

Atlantic Chemicals Company, Ltd., which was formed recently in New Brunswick, Canada, plans to produce sulphuric acid and superphosphate. The organization expects to serve the market in the Maritime Provinces.

Sulphur will be obtained from calcium sulphate (anhydrite) which is found in large quantities near the company's plant. The Department of Lands and Mines of the province states that supplies of the anhydrite far exceed demand. Large deposits, it is said, have not even been developed. The phosphate rock will be imported, probably from the United States or North Africa.

New Bemis Plant at Vancouver Reaches Full Production

The recently completed plant of the Bemis Paper Bag Company at Vancouver, Washington, has reached full production and is now completely serving the territory previously served by the Bemis plant at St. Helens, Oregon. The new building was constructed from plans constructed from plans drawn for Bemis, incorporating all elements of modern bag factory design.

During the period between closing of the St. Helens plant and reaching full production at Vancouver, Bemis continued to supply its customers in the Northwest from the company's paper bag manufacturing facilities at Wilmington, California; San Francisco; Peoria, Illinois; and East Pepperell, Massachusetts.

New Jones & Laughlin Coke Ovens in Operation

A new battery of 196 coke ovens began operation on August 6th at the Aliquippa, Pa. plant of the Jones & Laughlin Steel Co. Built by the Koppers Co., at a cost of $12,000,000, this battery is said to be one of the largest units in the world.

The new ovens will produce 53,000 tons of coke per month, as well as large quantities of by-products, including sulphate of ammonia, tar, benzol products, pyridine and other chemicals.

July Tag Sales

Reports to The National Fertilizer Association of State control officials in the 15 States using tax tags indicate that sales of fertilizer tax tags during July were at their lowest so far this year. The 362,000 equivalent short tons reported for July represented a drop of six per cent from a year ago, but were five per cent above two years ago, when sales were equivalent to 345,000 tons.

The 11 Southern States with sales during July amounting to 173,000 tons, accounted for only 48 per cent of total sales in all 15 States; this is the first time that July sales in the 11 Southern States have not been as great as in the four Midwestern States. Sales in four States, Arkansas, Louisiana, Texas and Oklahoma, were above last July, with Arkansas reporting the greatest tonnage increase. The remaining seven States all showed decreases, ranging from 1,000 tons for Alabama to 27,900 tons for North Carolina.

Reports from the four Midwestern States reveal that total sales amounted to 188,000 short tons, a seven per cent increase over the 176,000 tons for last July and a 38 per cent increase over two years ago. Compared with last year, sales during July increased 15 per cent and 63 per cent for Indiana and Kentucky respectively; for Missouri and Kansas, however, sales were off 12 per cent and 53 per cent respectively. The 118,000 tons reported for Indiana was the second highest month on record for that State, the highest being the 124,000 tons reported for November 1947.

Sales of fertilizer tax tags during the first

(Continued on page 18)

FERTILIZER TAX TAG SALES
COMPILED BY THE NATIONAL FERTILIZER ASSOCIATION

	July				January–July		
State	1948 Tons	1947 Tons	1946 Tons	% of 1947	1948 Tons	1947 Tons	1946 Tons
Virginia	17,411	24,830	24,299	101	459,770	457,329	453,995
N. Carolina	7,501	35,352	25,438	94	1,093,885	1,161,987	1,205,586
S. Carolina	8,768	19,954	21,118	105	656,436	624,201	674,561
Georgia	10,500	17,746	15,100	104	930,416	897,223	918,948
Florida	28,724	39,484	52,773	92	428,573	467,594	571,726
Alabama	28,341	29,350	22,750	137	803,555	587,150	700,500
Tennessee	11,783	14,717	16,770	127	317,722	250,144	246,425
Arkansas	16,619	....	9,550	135	181,125	133,830	126,100
Louisiana	5,350	4,850	6,302	105	134,307	127,480	136,613
Texas	22,453	19,846	11,719	122	280,216	229,863	216,801
Oklahoma	15,750	3,000	2,500	191	91,236	47,792	32,798
Total South	173,200	209,129	208,319	108	5,377,241	4,984,593	5,284,053
Inidana	117,517	102,047	95,925	123	526,218	429,068	386,658
Kentucky	34,555	21,188	10,600	139	377,287	271,342	240,961
Missouri	25,145	28,525	14,718	153	260,796	170,186	174,471
Kansas	11,213	23,775	15,000	112	68,733	61,548	33,227
Total Midwest	188,430	175,535	136,243	132	1,233,034	932,144	835,317
Grand Total	361,630	384,664	344,562	112	6,610,275	5,916,737	6,119,370

FERTILIZER MATERIALS MARKET

NEW YORK

Little Change in General in Materials Market. Most Materials Still Scarce. Price Advance on Nitrate of Soda. Some Foreign Potash Reported at Higher Prices. Better Demand for Fertilizer Organic Materials

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, August 18, 1948.

Sulphate of Ammonia

No further price changes have been noted. Fertilizer manufacturers are taking material on existing contracts and there has been some recent inquiry for export.

Nitrate of Soda

The price of this material was advanced by the importers about $3.50 per ton. Supply is still limited and the demand good.

Ammonium Nitrate

There were numerous inquiries in the market for this material with little being offered. Demand was good from all sections.

Nitrogen Solutions

Demand for nitrogen solutions was heavy and producers are trying to fill existing contracts. Some talk was heard of present producers increasing their production, along with one new producer in the field.

Nitrogenous Tankage

No price changes were noted and spot demand continued good at present low prices. Some producers were said to be sold up for the next few months.

Organics

Trading was rather restricted in tankage and blood due to lack of offerings. The demand from the feed trade has slowed down slightly but there seems to be a better demand from the fertilizer trade. Last sales of tankage and blood were made at $7.00 per unit of ammonia ($8.51 per unit N) f.o.b. shipping points but next sales are expected to be made on a little lower basis. Soybean meal and cottonseed meal were lower with the weakness in the oil markets and future positions were considerably under present prices. Some good buying was noted from some of the feed trade for future positions. Soybean meal sold as low as $56.00 per ton in bulk, f.o.b. Decatur, Ill. for future.

Fish Meal

As the season draws nearer the end, very little material was available for first hands but there were numerous re-sale lots on the market. Fish meal is expected to work into a stronger position as soon as the fishing season ends.

Castor Pomace

Material was moving on old contracts but no additional material was obtainable. The production is said to be slightly off and the demand has increased.

Bone Meal

Demand continued good for this material from both the fertilizer and feed trade and offerings were limited. Production has been held down by lack of raw material.

Hoof Meal

A tight situation prevailed and only one or two cars were being offered at $6.50 ($7.90 per unit N), f.o.b. shipping points.

Superphosphate

With most of the material under contract a quiet situation prevails with regard to this material. Triple superphosphate still is in active demand with no additional material offered. It is reported the Government may export some regular superphosphate under the Marshall Plan.

Potash

Some imported potash has been offered at a price considerably above the current market and so far no sales have been reported and no recent arrivals noted. Domestic producers have been able to obtain a better supply of box cars and are filling contracts for their regular customers.

PHILADELPHIA

Short Supply of Almost All Materials. Sulphate of Ammonia Resale Lots Bring High Prices. Nitrate of Soda Advances

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, August 16, 1948.

Normal superphosphate and low-testing organic fillers seem to be about the only raw materials in ample supply. Markets are strong with demand generally ahead of the supply.

Sulphate of Ammonia.—Market is very strong, with supply entirely inadequate to meet the demand. Resale material finds ready outlet at a premium, with prices reported at $65.00 to $75.00 per ton at shipping points.

Nitrate of Soda.—Market position remains strong and demand exceeds present available supply, despite the fact that the price of Chilean has been advanced $6.00 per ton. Contract price is now $48.00 per ton in bulk, and $51.50 in bags.

Ammonium Nitrate.—No let-up in demand, which is greater than the supply, and no resale offerings reported.

Castor Pomace.—No offerings reported, and production continutes under contract.

Blood, Tankage, Bone.—Price situation in blood and tankage remains practically unchanged, and the demand is somewhat easier. Demand for bone meal is fairly active with supply not too plentiful.

Fish Scrap.—Fair demand from feeding trade, but not sufficient to warrant any price advance. Sellers show no disposition to reduce prices to increase business.

Phosphate Rock.—Heavy demand takes care of current production and prevents accumulation of stocks. Increased production facilities have still not eased the supply position.

Superphosphate.—While triple is in scarce supply, normal grade is reported moving satisfactorily on contracts, and evidently there is no unsatisfied demand.

Potash.—There is still no easing up of the demand, and while shipments are reported moving more or less satisfactorily against contracts, the demand still continues in excess of production.

CHARLESTON

Shortage of All Materials Continues. Increase in Chilean Nitrate Prices. Nitrogen Solution Production Drops

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, August 16, 1948.

Organics.—The market on these continues very quiet as most manufacturers seem to have covered their reasonable wants.

Dried Ground Blood.—This is apparently scarce, although the nominal market is $7.00 to $7.25 per unit of ammonia ($8.51 to $8.82 per unit N) f.o.b. Chicago. Feed buyers are the ones most interested.

Chilean Nitrate of Soda.—The price on this has advanced $3.50 per ton, due to increased costof oil and labor.

Sulphate of Ammonia.—This is extremely scarce as practically all of the producers are now sold up for the season on a reasonable tonnage, and the market is $45.00 per ton bulk at the ovens.

Ammonium Nitrate.—The demand is far in excess of supply.

Nitrogen Solutions.—The fertilizer manufacturers are seriously worried as they have not been able to get as much of the nitrogen solutions as they did in the summer of 1947, and the indications are that the total quantity they will receive this season will be below last season.

Potash.—This continues to be extremely scarce, and it has not yet developed what amount of foreign potash will be brought in for the present season.

CHICAGO

Trading Slackens on Organics Market and Prices Show Lower Levels

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, August 16, 1948.

There has been scattered trading in animal ammoniates and feeding materials during the past week at prices somewhat lower than those which we last reported.

Digester tankage, 60 per cent protein, \$1.03 to \$1.04½. Unground dry rendered tankage, \$1.60 to \$1.65 per unit protein, f.o.b., and five cents per unit higher on a delivered basis. Wet rendered tankage is nominally \$7.00 to \$7.50 (\$8.51 to \$9.12 per unit N); dried blood, \$7.00 to \$7.25 (\$8.51 to \$8.82 per unit N); steamed bone meal, \$60.00 to \$65.00 per ton and raw bone meal now is quoted on about the same basis.

JULY TAG SALES

(Continued from page 14)

seven months of this year, January-July, totaled 6,610,000 equivalent short tons. Such sales represented a new record for January-July and were 12 per cent above the 5,917,000 tons reported for that period last year and eight per cent above the previous record high, which was reached two years ago.

For the 11 Southern States, the 5,377,000 tons represented a new high in January-July sales. Compared with last year, the increase amounted to eight per cent, and compared with the previous record high of 5,284,000 tons, reached two years ago, the increase amounted to two per cent. Nine of the States showed higher totals than for January-July of last year, with increases ranging from one per cent for Virginia to 91 per cent for Oklahoma. The other two States, North Carolina and Florida, reported decreases.

Increases over last year were reported for each of the four Midwestern States, with the total increase amounting to 32 per cent. The 1,233,000 ton total for January-July was also at a new high level.

Bids for Soil Conservation Superphosphate Opened

The U. S. Department of Agriculture has announced the bids received for the purchase of superphosphate for distribution to farmers in the soil conservation program. The bids, which were opened on August 19th, were received from 22 superphosphate producers and the amounts offered ranged from 1,000 to 30,000 tons. Most companies bid on the 20 per cent grade and prices ran from a low of \$17.25 to a high of \$26.25 per ton, f.o.b. shipping points. Some offers were received on 18 and 19 per cent material.

The companies who participated in the bidding, and the shipping points, were as follows: A. D. Adair & McCarty Bros., Atlanta, Ga.; Alabama Warehouse Co., Troy, Ala.; American Agricultural Chemical Co., East Weymouth, Mass.; Armour Fertilizer Works, Carteret, N. J. and Navassa, N. C.; Baugh & Sons Co., Baltimore, Md. and Philadelphia, Pa.; Central Chemical Corp., Hagerstown, Md., Consolidated Rendering Co., Lowell, Mass.; Cotton States Fertilizer Co., Macon, Ga.; Davison Chemical Corp., Baltimore, Md.; Empire State Chemical Co., Athens, Ga.; Georgia Fertilizer Co., Valdosta, Ga.; International Mineral & Chemical Corp., South Wilmington, Mass.; Meridian Fertilizer Co., Hattiesburg, Miss.; Pelham Phosphate Co., Pelham, Ga.; Roanoke Guano Co., Roanoke, Ala.; Standard Chemical Co., Troy, Ala.; Standard Wholesale Phosphate & Acid Works, Baltimore, Md.; Stauffer Chemical Co., Stege, Calif.; Summers Fertilizer Co., Searsport, Me.; I. P. Thomas & Son Co., Paulsboro, N. J.; U. S. Phosphoric Products Div, Tennessee Corp,. East Tampa, Fla.; Wilson & Toomer Fertilizer Co., Jacksonville, Fla.

PERMANENT SOIL PROGRAM

(Continued from page 8)

will be mainly limited by moisture limitation and not price limitations.

So much for the first post-Malthus century. What of the next century—especially the last half of it? Will population expand and can food be expanded proportionately? Land in crops in this country has in reality been stationary at around 360 million acres for the past quarter of a century. At the present rate of increase, the world's population would again be more than doubled by the end of the 20th century. Where is the increased food to feed a much larger world population to come from? If one compares two maps, one of the world's arable land and one of the world's population, they will be found to almost exactly coincide in areas of density and sparsity. One striking thing is evident that nearly all future expansion, except in irrigated lands, will be found in the humid forested areas—areas on which, heretofore, profitable use of fertilizer has been possible.

Plant Food Use

Plant food must, of necessity, be water soluble; and profitable use of commercial plant food must rest on available and conserved moisture. Although expansion of food production during the first post-Malthus century, was constantly on drier and drier soils where fertilizer has not and will not likely play a future major role, expansion during the coming century must be on the more humid soils where fertilizer will play a greatly expanding role in increased food production. In these areas, the smaller proportion of lands are at present used for crops and cleared pasture and further expansion of crop and pasture at the expense of woodland is possible. In these areas water limits the use of fertilizer to a much less extent than it does on the prairie soils of the world.

Thornthwaite has undertaken to place quantitative values on what he calls "the precipitation effectiveness" and gives an index value of at least 128 precipitation effectiveness in wet climates or rain forest areas; of around a 100 in humid or forest areas; a median of 48 in sub-humid or grassland areas; of 24 in semi-arid or steppe areas; and 8 in arid or desert areas. (See C. Warren Thornthwaite in the *Geographical Review* July, 1933, pp. 433–440). I give these not for the quantitative accuracy of the effectiveness of rainfall or availability of soil moisture in plant growth, but as illustrative only that possibly the greater availability of moisture in the forest areas means that moisture effectiveness is greatly in excess of that of the grasslands. In short, water conservation and use is one of the most limiting factors in meeting the food requirements for expanded population for the current century. And as improved methods of application and use of fertilizer are evolved, moisture conservation and effectiveness becomes a most vitally limiting factor in potential expansion of fertilizer use. It is also a factor in expanding food production. It means that especially on the great prairie soils expanded fertilizer use is most intimately associated with added conservation of water in the soils. The fertilizer industry should be more awake to the import of a sound soil and water conservation program as a prerequisite to a maximum expanded use of fertilizer.

(To be continued in the next issue)

CLASSIFIED ADVERTISEMENTS

FERTILIZER PAPERS AT A. S. C. MEETING

(Continued from page 10)

area, and 300 pounds per acre every four or five years on another. Manganese sulfate recommendations vary from mineral to muck soils and also with the soil reaction. What is enough borax for alfalfa is too much for oats. The amount of manganese sulfate needed by spinach on an alkaline soil is likely to be too much for potatoes on an acid soil. In the case of zinc it may be better to apply it in the spray for crops that are sprayed than in the fertilizer.

In the final analysis the best procedure will be what best fits the needs of the farmer. Unquestionably state laws are going to insist on their being guaranteed and farmers are eventually going to request their addition in definite amounts to meet the needs of their specific situation.

The Use of Commercial Fertilizer in Vegetable Crop Production at Seabrook Farms

Benjamin Wolf, The G. L. F.—Seabrook Farms Raw Products Research Division, Seabrook Farms, Bridgeton, N. J.

Approximately $333,000 were spent by Seabrook Farms for commercial fertilizers in 1947 to fertilize about 14,000 acres of vegetables. Both the amount and analysis used for the crops grown (mainly peas, beans, spinach and sweet corn) were based upon results of rapid soil tests. It has been possible to use rapid soil tests as a guide for fertilizer practice only after such tests have been closely correlated with crop yields and optimum levels of soil nutrients have been determined. Applying fertilizers based on crop needs and status of soil has been accomplished with about five different grades. One of the most striking changes in fertilizer practices brought about by the use of soil tests has been the introduction of a 1–1–1 fertilizer to replace a 1–3–2 for soils high in phosphorus and good in potassium. This has given a better balanced fertilizer at lower costs.

The ingredients going into mixed fertilizer are mainly ammoniated super, run-of-pile super, and muriate of potash. Ammoniated super has been found very resistant to leaching even on light soils. Other forms of nitrogen, such as ammonium nitrate and ammonium sulfate, are used in limited quantities in some fertilizers.

The trace elements manganese and boron are added to all fertilizers as Tecmangam and borax. The amounts added per ton vary depending upon the crop and the rate at which the fertilizer will be used. Generally, about five pounds of borax and 10 pounds of Tecmangam are applied per acre except in case of high soil *p*H, where the amounts are tripled.

Because of favorable *p*H (6.0 to 6.5) good available supplies of phosphorus and large amounts of fertilizer used, we have obtained best results when fertilizers are plowed under. Where large quantities of nitrogen are needed, some nitrogen will be applied as later side dressing in addition to cyanamide, being plowed under before planting the crop. Very good results have also been obtained by applying the fertilizer to established cover crops in the fall. This application increases yield of cover crop and tends to supply nutrients at a more uniform rate to the succeeding crop.

Broadcast application makes practical the use of bulk fertilizers. These fertilizers loaded at the fertilizer plant in spreader trucks are driven directly to the field and fertilizer is spread without further handling. Savings in handling and in bags bring fertilizer spread on the fields at the same cost as bagged fertilizer delivered to the farm.

Progress in Soil Testing in the South During the Last Decade

I. E. Miles, N. C. Department of Agriculture, Raleigh, N. C.

In 1939 soil testing was looked upon with askance by many, if not the majority, of the agronomists in the South. South Carolina had just completed its *p*H survey covering nearly two million samples. North Carolina was making lime and fertilizer recommendations while making only a *p*H test. The Virginia Truck Experiment Station had done some valuable work, but it was limited to a relatively small area of very heavily fertilized soils. Many commercial concerns were testing soils, some of which were doing good work

while others were seriously misleading the farmers. Often the recipient of the service found himself expecting this new service to give him every detail necessary to produce a good crop. Over-all, there was a great deal of confusion, misunderstanding and general lack of respect for the work.

Today, a different picture prevails. The farmer realizes that soil testing is not an exact science. The farmer must supply certain essential information, the experiment station recommendations are consulted, the soils in North Carolina, and perhaps other places, are classified and tested for *p*H, Ca, Mg, P, K, organic matter, and exchangeable H. Finally, all this is supplemented by information from the local agricultural leadership. Most agronomists now realize that soil testing, with all its limitations, has a very definite place in the over-all agricultural program. Most states have provided this service for the farmers and, where supervised by capable personnel and supported with ample funds, a great service has been rendered. Ten years ago much was expected by the farmer and often little was realized; today less is expected, but a great deal more is realized.

The Use of Composts, Night Soil and Unusual Fertilizers in the Soil Fertility Program of Japan

C. L. W. Swanson, Connecticut Agricultural Experiment Station, New Haven, Conn.

Farm manures have always been of great importance in the fertilizer program of the Japanese farmer. Among the various farm manures used by Japanese farmers, compost is the most important source of plant nutrients. In 1946, it supplied 47 per cent of the total nitrogen, 66 per cent of the total phosphoric acid, and 64 per cent of the total potash applied to the soils of Japan.

Night soil ranks next to compost in the Japanese farm manuring program. In 1946, night soil supplied 16 per cent of all nitrogen, 8 per cent of all the phosphorus, and 10 per cent of all the potassium consumed on Japanese farms. During the same year other farm manures such as plant ashes, sea weed, and animal excrements supplied 14 per cent of the nitrogen, 15 per cent of the phosphorus, and 16 per cent of the potassium.

The common method for making composts is described. Information on the handling of night soil, both storage and application, is given. Survival periods and other information on various pathogenic organisms in stored and applied night soil are presented. Data on the composition of composts, night soil, and other kinds of farm manures are included as well as recommended applications of night soil and compost for the important food crops grown in Japan.

Fertilizer Progress in Bizonal Germany

K. D. Jacob, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md., and R. W. Cummings, North Carolina Agricultural Experiment Station, Raleigh, N. C.

The fertilizer situation in Bizonal Germany is discussed with respect to facilities and capacity for manufacture of fertilizers; production of nitrogen, phosphate, and potash; and the plant-food requirements of the Bizone. The outlook for further progress in the fiscal years 1948–49 to 1950–51 is indicated.

Bizonal Germany consumed 303,400 metric tons of N, 352,300 tons of P_2O_5, and 529,200 tons of K_2O as commercial fertilizer in the fiscal year 1938–39. The requirements in 1947–48 were estimated at 320,000 360,000, and 574,000 tons, respectively. Correspondingly, the estimated requirements in 1948–49 are 400,000, 480,000, and 720,000 tons.

With the possible exception of nitrogen, the pre-war manufacture of fertilizers in the Bizone exceeded the consumption of such materials in the area. Subsequently, the production has been greatly reduced by damage to plants; shortages of repair and building materials, equipment, power, transportation, and labor; insufficient supplies of coal, certain other raw materials, and necessary chemicals; large decreases in manufacture of coke and steel; and other factors. Although major attention is being given to the problem and considerable progress has been made in the past two years, it appears that the production of fertilizers, especially phosphates, will not correspond fully to the requirements until after 1951.

In 1947–48 the outputs of N, P_2O_5, and K_2O for fertilizer use amounted to about

165,000, 125,000, and 410,000 metric tons, respectively. Correspondingly, the estimated productions in 1948–49 are 230,000 200,000, and 500,000 tons; in 1950–51 they are 340,000, 288,000, and 675,000 tons.

Relation Between Plant Nutrients Removed from Soils by Harvesting Crops and Replaced in Fertilizers and Manures

A. L. Mehring, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

The quantities were determined of nitrogen, P_2O_5 and K_2O removed from soils of each state in the harvested portions of 100 crops and applied in commercial fertilizers and manures in 1947. More P_2O_5 is being added to soils of the United States as a whole than is being removed in the harvested portions of crops. Only about two-thirds of the nitrogen and K_2O removed is being replaced in this way.

Great differences are shown in the rates of replacement in different sections of the country. Farmers in the eastern states are replacing more nutrients in the form of fertilizers and manures than they are removing, whereas in the western states only a small fraction is being replaced in most cases.

In the northern states much animal manure is applied to crop land, whereas very little manure is thus used in the southern states.

Other factors are involved in maintaining soil fertility. Nevertheless this study in connection with various agronomic studies indicates that in general nutrient ratios of fertilizers should be changed to contain more nitrogen and K_2O in proportion to P_2O_5 for most efficient results under present conditions, although numerous exceptions to this generalization exist. For example, it is believed that a 4–12–8 fertilizer would be more efficient in increasing crop yields in many cases than the 2–12–6 now used.

SOME IMPLICATIONS OF SOIL FERTILITY

(Continued from page 11)

practices in civilized living. The quality of intelligence in people fixes quite generally the quality of the land on which they live. The chemical content of the land may be low. With intelligence it may be improved. Poor land, generally, can be improved by better building, churches and schools, and above all, the investment of years of loving care devoted to the soil, its orchards and gardens.

Soil Improvement Needed Now

Soil, like society, is not improved immediately by waiting for a day when our economic set-up is perfect or when all farmers are moved to rich land. If more good farmers had the national welfare at heart then we would have less of a national scandal in the wastage of our soil. The condition of a community is often a good soil test. Where a civilization neglects its rural life the poorer land will show the effects first, but this same character of neglect will ultimately show up in substantially the same way in the areas of the good land as well. This neglect is an evil, mostly spiritual and biological. It cuts across the seed-bed, not only of America but of the world. It is heightened in Europe by reason of warfare, and U. S. D. A. spokesmen have estimated that it will be 25 years before the land of Europe may be fully restored to adequate fertility.

We need the spiritual leadership that has dynamic and drive sufficient to inspire men to take the proper measures which will save their soil and communities.

On the Long Trail through Vermont there is a cabin in which hikers may stay over night. Out in back of the cabin there is a sign over the woodpile which reads: "Please leave the woodpile a little higher than you found it."

That is not only the essence of conserva-

tion, it is a religious concept and a mighty act. We all have a share in this process. Throughout the fertilizer organizations there is opportunity for continuing study and research as well as increasing the sales and distribution phases which make these products available to the users of the essentials of soil enrichment. By this process our national "soil-pile" may be improved. Another part of the conservation team, are the colleges that teach the use of these products. Still another potential part of this team are many of the certified dairy farms in America, which provide an opportunity for experimentation under conditions of reality. To leave the woodpile a little higher than we found it in our generation for the next, as far as the matter of adequate soil management and restoration is concerned, is to suggest a difficult task.

Some Economic Implications

We of the dairy industry take pride in being handlers of nature's most nearly perfect food, milk. The contribution of milk to the total daily food requirements of a person is especially significant in comparison with other foods. In terms of calories alone a cup of milk may provide 170, while coffee with sugar and cream yields but 53, and a six-ounce bottle of soft drink but 75. We like to compare the cost of these other items to the cost of a bottle of milk, and note the superior value received by the consumer in milk. Nutritionists of the National Dairy Council have prepared a comparison of the food values of the average servings in commonly-eaten foods. In contrast with milk which offers food value in the entire range of calories, protein, calcium, iron, Vitamin A, Thiamine, Ascorbic Acid, and Riboflavin, soft drinks offer nothing except the limited caloric value.

We are probably more conscious on our American scene of the soft drink because of the tremendous advertising campaigns which popularize and make the product so readily available. In the dairy industry we do not enjoy the margin of return which permits such widespread promotion. Competition among dairy organizations is another limiting factor. But milk remains the "best buy" for the American public at any price. While the index of other food items has increased 101 per cent in New York City from March, 1940, to March, 1948, the selling price of milk has risen but 58.9 per cent.

I would suggest that it is to the interest of the fertilizer industry that the nation's dollar is wisely spent for nourishment. There is a realistic approach to this matter. What part of the 15,000,000 tons of fertilizer sold last year went on to the fields of dairy farmers? Is the dairy industry as great a potential in the operations of the fertilizer industry as it should be? We know from the standpoint of farm operations that proper fertilization and management practices will produce greater yields per unit. These are the quantitative facts which are established with greater apparence. We know that farmers may succeed or fail according to the knowledge and intelligence they apply to their farm operations.

Better Pastures Pay Big Dividends

In the dairy industry of New England we are particularly interested in the green pastures program which has achieved wide acclaim and promise that other states will follow similar programs. It is based on the simple fact that better pastures pay big dividends immediately. We are exploring the real possibilities of growing more roughage and pasture crops on New England soil with a view to increasing the economic efficiency of milk in New England.

The importance of pastures in New England's agricultural economy rests upon the cow. As Carl Bender, dairy research specialist of the New Jersey State College of Agriculture, states, "The cow was designed by the Almighty for the consumption of roughage crops. This animal is a mobile harvesting machine equipped with a mower and grinder at one end and a fertilizer spreader on the other. In between these extremes is located an extremely complex manufacturing plant specially designed for the conversion of large quantities of raw materials—pasture, silage, hay—into nature's most nearly perfect food, milk."

The efficiency of dairy farmers depends to a large degree on the cost of the raw material he puts into this machine. Furthermore, the quantity of that roughage and raw material is important to the end product, milk.

An acre of good pasture in Massachusetts would at present prices yield $150.00 worth of feed. This means that 100 pounds of digestible feed from pasture costs $1.26 contrasted with $4.23 for a comparable amount of concentrate grain feed. Poor pastures will yield about 500 pounds of this feed, while good pastures can yield 1,500 pounds or more. We know there is an economic saving which can accrue to dairy farmers in terms of greater profit on their farm. We expect that there is a real possibility for improving the nutritional value of the milk produced on these farms from controlled management of home grown crops. Herein lies the crux of our common interest in this problem. Can the fertilizer industry show how their products will help this two-fold aim—one of lowering costs of milk production on the farm, and the other of improving the quality and the nutritional value of the end product. This is not limited alone to the dairy industry. It can be applied to the vegetable and fruit crop production of the nation as well.

Fertilizer Use at All-Time High

It is encouraging to note from the report of your president that use of commercial fertilizer reached an all-time high in 1947. Fifteen million tons of fertilizer is a great quantity, and it is especially significant that the total has increased yearly during the past nine years.

It is obvious that dairy farmers can increase the efficiency of their farm operations by increasing the amount of farm-grown nutrients, from an average ratio in New England of about one pound of grain for each three pounds of milk produced to a ratio of one to five. A net decrease or saving to the dairy farmer in the costs of production can be realized of at least 50 cents per hundredweight. This is very conservative. If this fact can be practically interpreted and applied to the entire milk production of the nation it would mean an increase of nearly $600,000,000 annually in extra cash that the dairy farmers would have to spend in improving their standards of living wherever they live. This is a matter of vital significance to the entire rural community. It means more spending and purchasing power. It means the opportunity for better schools, churches and business. The accomplishment of this involves the interest of the fertilizer industry. We have tried to estimate what part of the 15,000,000 tons of fertilizer sold last year went on to dairy farms. Using Vermont as a reference, it figures, on the basis of estimation only, that about eight and a half pounds of fertilizer were used per acre on the hay, pasture and other roughage crop lands of the state.

If the average of the nation is as high as that, then only about 1 per cent or 1,500,000 tons went on to dairy farms in the production of milk. If ever a dairy farmer used as much as a quarter of a ton per acre on the average, the total potential fertilizer business in the dairy industry alone would nearly triple today's national fertilizer sales.

There is, then, this two-sided frontier of quantitative advance and of qualitative control. It is obvious that there is much common benefit to the fertilizer and the dairy industries in the progress made along these two fronts.

There is a missing link between the facts of adequate quantitative observation and practice and the qualitative results. From the best information we can obtain, we are not able to show that well-fertilized farms, with a consideration for all of the mineral values, produce digestible nutrients which in turn enable a cow to yield milk of a predetermined nutritional value. We have referred to the standard of nutritional content, and even of this we have made insufficient promotional use.

Is there a basis for cooperative effort between the fertilizer industry and the certified milk industry, for instance, to conduct research, to apply experimental practices, and to seek facts which will be of value to both groups? For years the certification of milk has produced amazing results from the standpoint of sanitation and cleanliness. Now, let us again be the "guinea pig" of this new frontier, and make some of our farms available for the extension of experimental practices in the interests of nutritional control with its broader implications for society.

BUYERS' GUIDE • A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

AMMONIA—Anhydrous and Liquor
Commercial Solvents Corp., New York City
Spencer Chemical Co., Kansas City, Mo.

AMMONIUM NITRATE
Lion Oil Co., El Dorado, Ark.
Spencer Chemical Co., Kansas Cy, Mo.

BAG MANUFACTURERS—Burlap
Bemis Bros. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

BAG MANUFACTURERS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

BAG MANUFACTURERS—Paper
Bemis Bro. Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Hammond Bag & Paper Co., Wellsburg, W. Va.
International Paper Co., Bagpak Div., New York City
Jaite Company, The, Jaite, Ohio
Raymond Bag Co., Middletown, Ohio
St. Regis Paper Co., New York City

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Huber & Company, New York City
McIver & Son, Alex. M., Charleston, S. C.

BAG CLOSING MACHINES
St. Regis Paper Co., New York City
Union Special Machine Co., Chicago, Ill.

BAG PRINTING MACHINES
Schmutz Mfg. Co., Louisville, Ky.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, The, East Point, Ga.
St. Regis Paper Co., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Company, Boston, Mass.

BONE BLACK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Huber & Company, New York City

BONE PRODUCTS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
Huber & Company, New York City
Jackle, Frank R., New York City.
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Schrock Fertilizer Service, Congerville, Ill.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BUCKETS—For Hoists, Cranes, etc.
Hayward Company, The, New York City

BUCKETS—Elevator
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARS AND CARTS
Atlanta Utility Works, The, East Point, Ga.
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind

CHEMICALS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Commercial Solvents Corp., New York City
Davison Chemical Corporation, Baltimore, Md.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Lion Oil Company, El Dorado, Ark.
McIver & Son, Alex. M., Charleston, S. C.
Spencer Chemical Co., Kansas City, Mo.
Virginia-Carolina Chemical Corp., Richmond, Va.
Woodward & Dickerson, Inc., Philadelphia, Pa.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Wiley & Company, Baltimore, Md.

CONDITIONERS
Arkansas Rice Growers Corp. Assn., Stuttgart, Ark
Jackle, Frank R., New York City.
Keim, Samuel D., Philadelphia, Pa.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

CYANAMID
American Agricultural Chemical Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City

DRYERS
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Titlestad Corporation, Nicolay, New York City

FERTILIZER (Mixed) MANUFACTURERS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Davison Chemical Corporation, Baltimore, Md.
International Minerals & Chemical Corporation, Chicago, Ill.
Schrock Fertilizer Service, Congerville, Ill.
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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Sturtevant Mill Company, Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Woodward & Dickerson, Inc., Philadelphia, Pa.

INSECTICIDES
American Agricultural Chemical Co., New York City

LEAD BURNERS
Southern Lead Burning Co., Atlanta, Ga.

LIMESTONE
American Agricultural Chemical Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
McIver & Son, Alex. M., Charleston, S. C.

LOADERS—Car and Wagon
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making and Handling
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Ammoniating
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, The, East Point, Ga.
Hough Co., The Frank G., Libertyville, Ill.
Hayward Company, The, New York City
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, The, East Point, Ga.
Bradley Pulverizer Co., Allentown, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Material Handling
Atlanta Utility Works, The, East Point, Ga.
Hayward Company, The, New York City
Hough Co., The Frank G., Libertyville, Ill.
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
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MACHINERY—Mixing, Screening and Bagging
Atlanta Utility Works, The, East Point, Ga.
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Power Transmission
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Superphosphate Manufacturing
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.

MINOR ELEMENTS
Agricultural Minerals Co., Montgomery, Ala.
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

NITRATE OF SODA
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Il.
McIver & Son, Alex. M., Charleston, S. C.

NITROGEN SOLUTIONS
Lion Oil Company, El Dorado, Ark.
Spencer Chemical Co., Kansas City, Mo.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J. New York City
Davidson Commission Co., The, Chicago, Ill.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill
Jackle, Frank R., New York City.
McIver & Son. Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Virginia-Carolina Chemical Corp., Richmond, Va.

PLANT CONSTRUCTION—Fertilizer and Acid
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Southern Lead Burning Co., Atlanta, Ga.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Titlestad Corporation, Nicolay, New York City

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City
Potash Co. of America, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
United States Potash Co., New York City

PRINTING PRESSES—Bag
Schmutz Mfg. Co., Louisville, Ky.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.

REPAIR PARTS AND CASTINGS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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SCREENS
Atlanta Utility Works, The, East Point, Ga.
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

SEPARATORS—Air
Kent Mill Co., Brooklyn, N. Y.
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Co., Boston, Mass.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SULPHATE OF AMMONIA
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULPHUR
Ashcraft-Wilkinson Co., Atlanta, Ga.

SULPHURIC ACID
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicaro, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Southern States Phosphate Fertilizer Co., Savannah, Ga.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davison Chemical Corporation, Baltimore, Md.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City.
Southern States Phosphate Fertilizer Co., Savannah, Ga.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

TAGS
Keener Mfg. Co., Lancaster, Pa.

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Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davidson Commission Co., The, Chicago, Ill.
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

VALVES
Atlanta Utility Works, The, East Point, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

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